

Corrosion-resistant material. Material that has at least the corrosion-resistant properties of type 304 stainless steel.

Diesel engine. Any compression ignition internal combustion engine using the basic diesel cycle where combustion results from the spraying of fuel into air heated by compression.

Exhaust emission. Any substance emitted to the atmosphere from the exhaust port of the combustion chamber of a diesel engine.

Intermediate speed. Maximum torque speed if it occurs between 60 percent and 75 percent of rated speed. If the maximum torque speed is less than 60 percent of rated speed, then the intermediate speed shall be 60 percent of the rated speed. If the maximum torque speed is greater than 75 percent of the rated speed, then the intermediate speed shall be 75 percent of rated speed.

Low idle speed. The minimum no load speed as specified by the engine manufacturer.

Maximum torque speed. The speed at which an engine develops maximum torque.

Operational range. All speed and load (including percent loads) combinations from the rated speed to the minimum permitted engine speed at full load as specified by the engine manufacturer.

Particulates. Any material collected on a specified filter medium after diluting exhaust gases with clean, filtered air at a temperature of less than or equal to 125 °F (52 °C), as measured at a point immediately upstream of the primary filter. This is primarily carbon, condensed hydrocarbons, sulfates, and associated water.

Percent load. The fraction of the maximum available torque at an engine speed.

Rated horsepower. The nominal brake power output of a diesel engine as specified by the engine manufacturer with a specified production tolerance. For laboratory test purposes, the fuel pump calibration for the rated horsepower must be set between the nominal and the maximum fuel tolerance specification.

Rated speed. Speed at which the rated power is delivered, as specified by the engine manufacturer.

Steady-state condition. Diesel engine operating condition which is at a constant speed and load and at stabilized temperatures and pressures.

Total oxides of nitrogen. The sum total of the measured parts per millions (ppm) of nitric oxide (NO) plus the measured ppm of nitrogen dioxide (NO₂).

§ 7.83 Application requirements.

(a) An application for approval of a diesel engine shall contain sufficient information to document compliance with the technical requirements of this subpart and specify whether the application is for a category A engine or category B engine.

(b) The application shall include the following engine specifications—

- (1) Model number;
- (2) Number of cylinders, cylinder bore diameter, piston stroke, engine displacement;
- (3) Maximum recommended air inlet restriction and exhaust backpressure;
- (4) Rated speed(s), rated horsepower(s) at rated speed(s), maximum torque speed, maximum rated torque, high idle, minimum permitted engine speed at full load, low idle;
- (5) Fuel consumption at rated horsepower(s) and at the maximum rated torque;
- (6) Fuel injection timing; and
- (7) Performance specifications of turbocharger, if applicable.

(c) The application shall include dimensional drawings (including tolerances) of the following components specifying all details affecting the technical requirements of this subpart. Composite drawings specifying the required construction details may be submitted instead of individual drawings of the following components—

- (1) Cylinder head;
- (2) Piston;
- (3) Inlet valve;
- (4) Exhaust valve;
- (5) Cam shaft—profile;
- (6) Fuel cam shaft, if applicable;
- (7) Injector body;
- (8) Injector nozzle;
- (9) Injection fuel pump;
- (10) Governor;
- (11) Turbocharger, if applicable;
- (12) Aftercooler, if applicable;
- (13) Valve guide;

§ 7.84

(14) Cylinder head gasket; and
 (15) Precombustion chamber, if applicable.

(d) The application shall include a drawing showing the general arrangement of the engine.

(e) All drawings shall be titled, dated, numbered, and include the latest revision number.

(f) When all necessary testing has been completed, the following information shall be submitted:

(1) The gaseous ventilation rate for the rated speed and horsepower.

(2) The particulate index for the rated speed and horsepower.

(3) A fuel deration chart for altitudes for each rated speed and horsepower.

§ 7.84 Technical requirements.

(a) *Fuel injection adjustment.* The fuel injection system of the engine shall be constructed so that the quantity of fuel injected can be controlled at a desired maximum value. This adjustment shall be changeable only after breaking a seal or by altering the design.

(b) *Maximum fuel-air ratio.* At the maximum fuel-air ratio determined by § 7.87 of this part, the concentrations (by volume, dry basis) of carbon monoxide (CO) and oxides of nitrogen (NO_x) in the undiluted exhaust gas shall not exceed the following:

(1) There shall be no more than 0.30 percent CO and no more than 0.20 percent NO_x for category A engines.

(2) There shall be no more than 0.25 percent CO and no more than 0.20 percent NO_x for category B engines.

(c) *Gaseous emissions ventilation rate.* Ventilation rates necessary to dilute gaseous exhaust emissions to the following values shall be determined under § 7.88 of this part:

Carbon dioxide	— 5000 ppm
Carbon monoxide	— 50 ppm
Nitric oxide	— 25 ppm
Nitrogen dioxide	— 5 ppm

A gaseous ventilation rate shall be determined for each requested speed and horsepower rating as described in § 7.88(b) of this part.

(d) *Fuel deration.* The fuel rates specified in the fuel deration chart shall be based on the tests conducted under paragraphs (b) and (c) of this section and shall ensure that the maximum fuel:air (f/a) ratio determined under

paragraph (b) of this section is not exceeded at the altitudes specified in the fuel deration chart.

(e) *Particulate index.* For each rated speed and horsepower requested, the particulate index necessary to dilute the exhaust particulate emissions to 1 mg/m³ shall be determined under § 7.89 of this part.

§ 7.85 Critical characteristics.

The following critical characteristics shall be inspected or tested on each diesel engine to which an approval marking is affixed—

(a) Fuel rate is set properly; and

(b) Fuel injection pump adjustment is sealed, if applicable.

§ 7.86 Test equipment and specifications.

(a) Dynamometer test cell shall be used in determining the maximum f/a ratio, gaseous ventilation rates, and the particulate index.

(1) The following testing devices shall be provided:

(i) An apparatus for measuring torque that provides an accuracy of ± 2.0 percent based on the engine's maximum value;

(ii) An apparatus for measuring revolutions per minute (rpm) that provides an accuracy of ± 2.0 percent based on the engine's maximum value;

(iii) An apparatus for measuring temperature that provides an accuracy of ± 4 °F (2 °C) of the absolute value except for the exhaust gas temperature device that provides an accuracy of ± 27 °F (15 °C);

(iv) An apparatus for measuring intake and exhaust restriction pressures that provides an accuracy of ± 5 percent of maximum;

(v) An apparatus for measuring atmospheric pressure that provides an accuracy of ± 0.5 percent of reading;

(vi) An apparatus for measuring fuel flow that provides an accuracy of ± 2 percent based on the engine's maximum value;

(vii) An apparatus for measuring the inlet air flow rate of the diesel engine that provides an accuracy of ± 2 percent based on the engine's maximum value; and

(viii) For testing category A engines, an apparatus for metering in 1.0 ± 0.1